



**Wolverine**  
Oilfield Technologies

# NEUTRINO™

## ULTRA-HIGH-SPEED MODULAR MWD PLATFORM

### NEUTRINO™ ULTRA-HIGH-SPEED MODULAR MWD

#### NEUTRINO™ High-Speed Pulser

- Interchangeable Sleeve Assemblies (4 ¾ – 8" sizes available)
- Poppet Orifice Configurations Interchangeable in Slips for Pulse Size Adjustment
- Pulser Tool Kit
- Pulser Running Gear

#### NEUTRINO™ Directional Module

- Proprietary Master/ Triple Power Supply

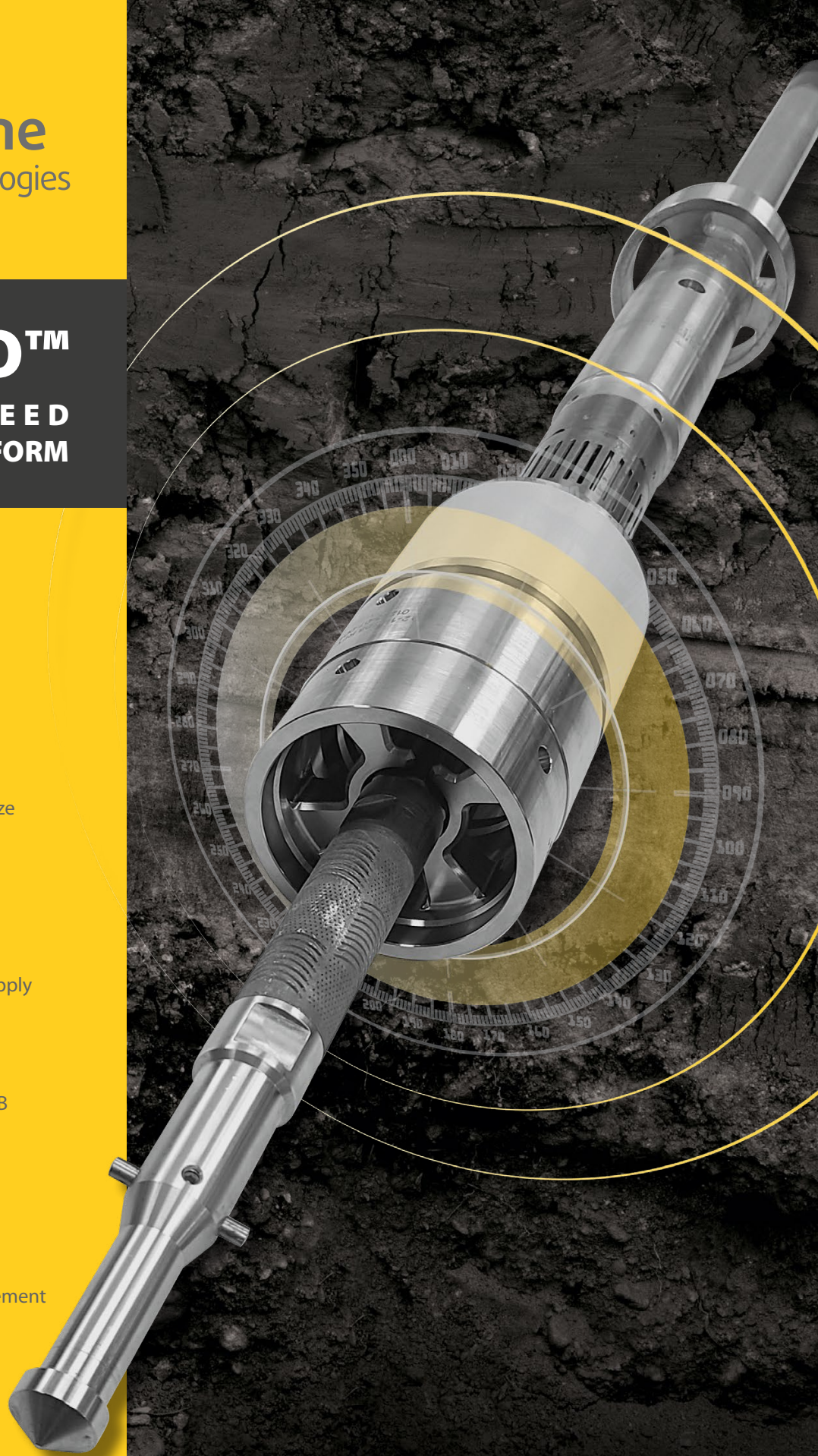
#### NEUTRINO™ Surface System

- Proprietary Encoding System
- Compatible WITS out to QuantumDB Logging Suite

#### Total Gamma

#### Batteries

- Standard 8 Cell Lithium Batteries
- 150-Watt Turbine as Battery Replacement



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# CONTINUOUS INNOVATION

# IN TOUCH WITH TOMORROW

At 2 bits/sec we deliver 4 times the speed of other telemetry systems

**NEUTRINO™** uses an encoding method that is 40% more efficient than other encoding methods

## INSTRUMENT ACCURACY SPECIFICATIONS

Inclination	
Absolute	± 0.1°
Spread	± 0.1°
Azimuth (Magnetic Dip Angle at <70°)	
At 5° inclination	
Absolute	± 1.2°
Spread	± 1.0°
At 10° inclination	
Absolute	± 1.0°
Spread	± 0.75°
At 90° inclination	
Absolute	± 0.5°
Spread	± 0.5°
<b>Toolface Accuracy, Axial Rotation, 10 through 90 inc</b>	± 1.0°
<b>Total G Field Accuracy, Absolute</b>	± 3.0 mg
<b>Total H Field Accuracy, Absolute</b>	+/- 4.0 mGauss
<b>RPM Measurement, 10 to 255 RPM</b>	± 0.5 of value

## MECHANICAL & ENVIRONMENTAL SPECIFICATIONS

<b>Outside Diameter</b>	1.875 in. [47.6 mm]
<b>Length (W/End Caps)</b>	56.73 in. [1.44 m]
<b>Operating Temperature</b>	32° to 347°F [0 to 175°C]
<b>Survival Temperature</b>	-40° to 365°F [-40° to 185°C]
<b>Vibration (Random)</b>	20 g RMS, 10 to 200 Hz
<b>Shock</b>	1000 g, 0.5 mSec, half-sine

*Imperial UOM [Metric UOM]*

## ENVIRONMENTAL CAPABILITIES

Standard Measurements	6-axis static surveys, continuous inclination and azimuth*, gamma, shock and vibration, RPM, and temperature		
Inclination	Absolute	± 0.1°	
	Spread	± 0.1°	
Azimuth (Magnetic Dip Angle at <70°)	At 10° inclination	Absolute	± 1.0°
		Spread	± 0.75°
	At 90° inclination	Absolute	± 0.5°
		Spread	± 0.5°
Continuous Inclination (cInc) Accuracy		up to 150 RPM	
cInc (Inc <10°)		- 1.0 / +3.0°	
cInc (Inc >10°)		+ / - 0.5°	
Continuous Azimuth (cAzM) Accuracy		up to 150 RPM	
cAzM (Inc <45°)		+ / - 15°	
cAzM (Inc >45°)		+ / - 5°	
Toolface Accuracy, Axial Rotation, 10 through 90 inc		± 1.0°	
Total G Field Accuracy, Absolute		± 3.0 mg	
Total H Field Accuracy, Absolute		+/- 4.0 mGauss	
RPM Measurement, 10 to 255 RPM		± 0.5 of value	
Gamma Accuracy		+ / - 0.5 cps	

## TECHNICAL SPECIFICATIONS

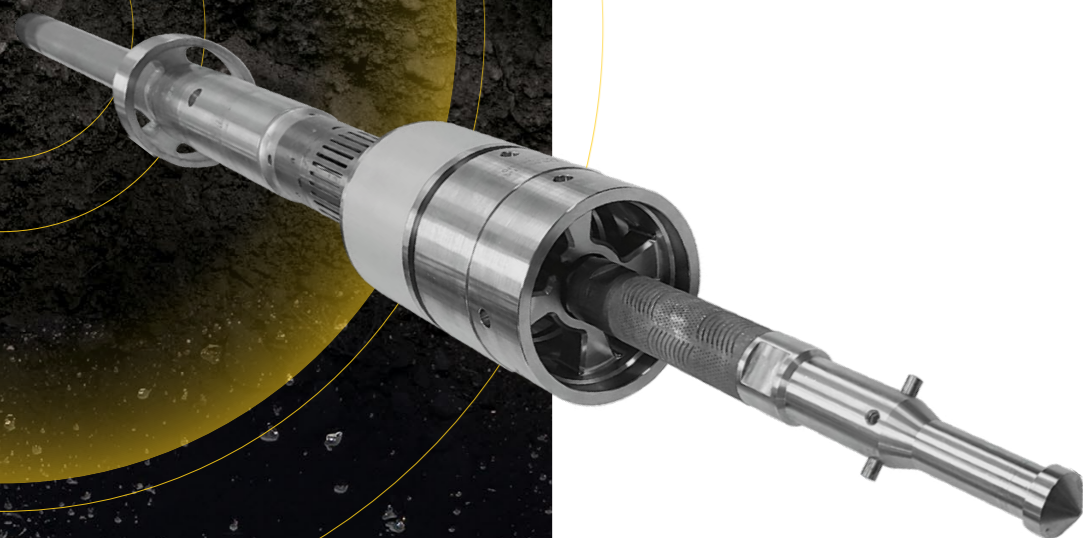
Tool Size (OD)	4 ¾"	6 ½"	6 ¾"	8"
<b>Transmission Speed</b>	2-10 Bit/Sec (Neutrino™ MWD)			
<b>Compatibility</b>	Neutrino™ MWD / Tolteq MWD / GE MWD			
<b>Connection Uphole</b>	3 ½" IF(NC38) Box	4 ½" XH (NC50) Box	4 ½" IF (NC50) Box	6 5/8" Reg Box
<b>Connection Downhole</b>	3 ½" IF(NC38) Pin	4 ½" XH (NC50) Pin	4 ½" IF (NC50) Pin	6 5/8" Reg Pin
<b>Orifice/Collar Size</b>	Orifice/Collar Size Configurable on Rigsite			
<b>Flow Range (GPM)</b>	200-500		300-800	400-1000
<b>Battery Life</b>	486hrs @ 2bits/sec 552hrs @ 0.5bits/sec (2 bat config)			
<b>Pulse Width (configurable)</b>	0.32s/pulse		(Reliable 0.064s/pulse)	
<b>LCM Tolerance</b>	60 ppb			

## REAL-TIME DATA

- Shock
- Vibe
- RPM
- Stick/Slip
- Inclination / Azimuth (with R-Nav)

## INTEGRATED PUMP RECOGNITION

## AGITATOR NOISE FILTRATION

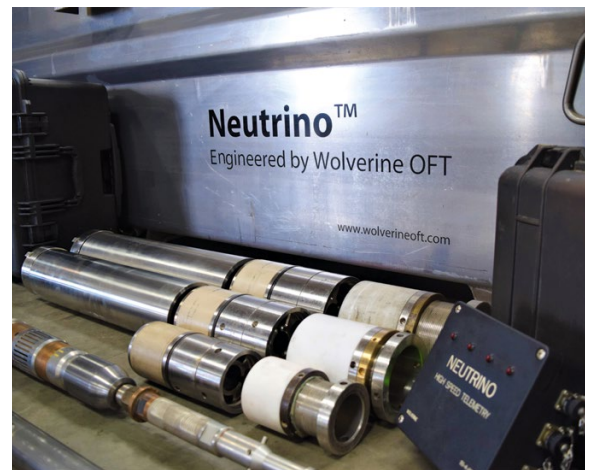


# NEUTRINO™ KIT ASSEMBLY

## FEATURES & BENEFITS

- Operational time and environmental history recorded in internal memory\*
- On-board rotation detection
- Shock, vibration and RPM pulsed to surface in real time
- Addition of new rotation sequence
- Advanced internal logging\*
- Internal current usage logged to memory\*
- Start power management – efficient battery switching and logging of voltage and current
- Fluxgate magnetometers
- Quartz-flexure accelerometers
- Legacy compatible
- Enhanced circuit protections
- Calibration coefficients included directly into module memory

\* Available with iDM NXT and NXT pulsers



Wolverine Oilfield Technologies is a subsidiary of NewTech Services Holding Limited, an international oilfield services company founded in 2009.

NewTech Services Holding Limited develops technology and expertise within 4 Business Divisions: Drilling Services, Completion Systems, Integrated Project Management, and Capital Equipment.

NewTech Services Holding Limited supplies technology products and services to the oil and gas exploration and production industry in Russia and CIS, Europe, Middle East, North and South America.

Wolverine Oilfield Technologies is a subsidiary of NewTech Services Holding Limited specializing in drilling technology products such as MWD/LWD/RSS.



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